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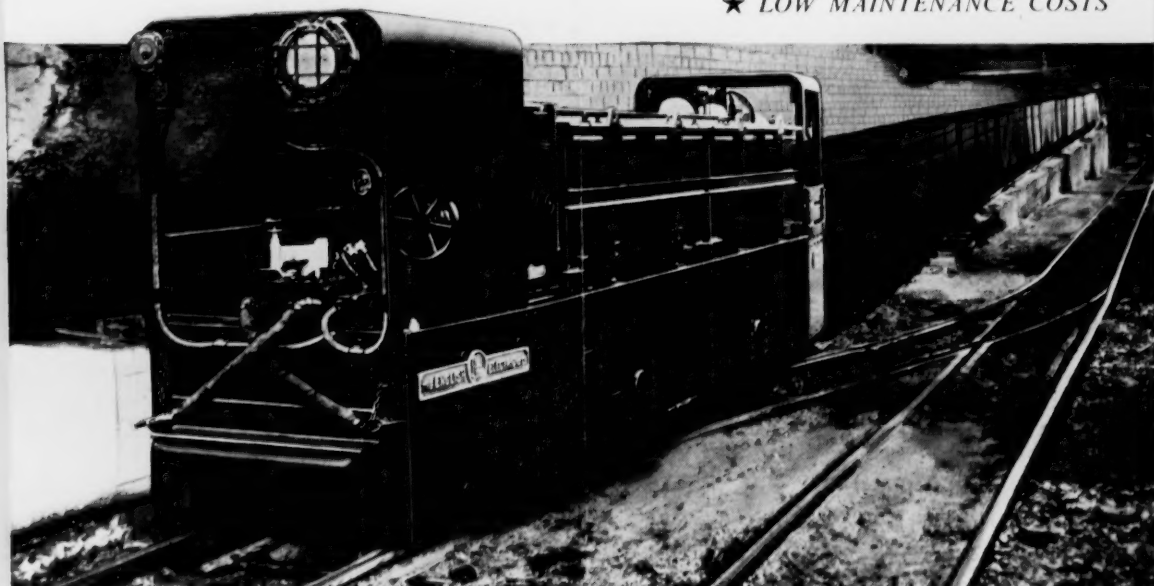
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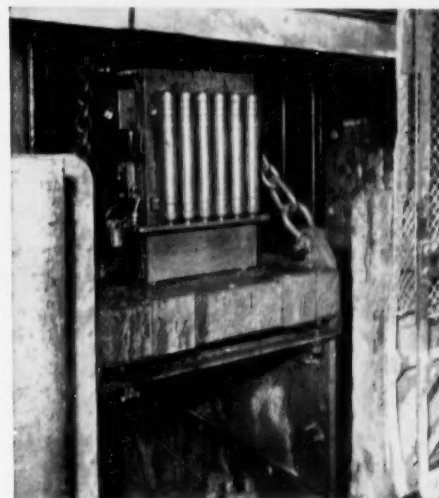
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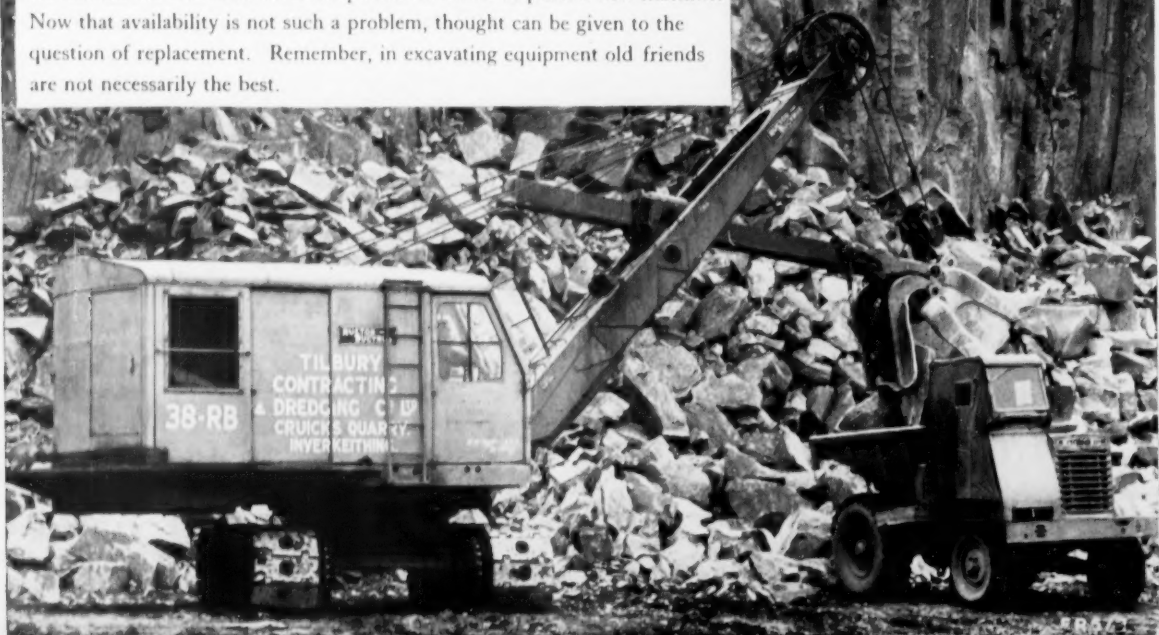
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NOTES AND COMMENTS

World Bank Approval of Kariba Project

It will be recalled that the Kariba hydro-electric power project in the Central African Federation has been the subject of regular comment in *The Mining Journal*, and it is therefore of interest that latest reports from Salisbury point out that the World Bank has indicated its willingness, in principle, to participate in the financing of the scheme. The Federal Government's decision to proceed with the Kariba scheme in preference to Kafue had been subject to the reservations of the final favourable appraisal already given by M. Andre Coyne, and a favourable opinion by the World Bank economic mission which visited the Federation during April and May of this year.

The Bank has now declared that, providing certain conditions were satisfied, economic factors would not bar the Bank from considering a loan for the project. These conditions were that the Kariba scheme prove on examination to be a suitable project; that final estimates of the cost of the scheme did not depart significantly from estimates already given; and that final estimates of resources available for financing the Kariba project and the Federation's other development schemes did not differ significantly from estimates given to the Bank. These facts were announced by Lord Malvern, the Federal Prime Minister, who added that the next step would be for the Bank to make a thorough technical appraisal of the Kariba project.

No details of loan amounts have been given but local reports quote a figure of £28,000,000 from the World Bank, £8,000,000 to be raised locally and the balance up to the required £54,000,000 from the Colonial Development Corporation and other British Government sources.

Preliminary work on the scheme is steadily gaining momentum, and there are now 35 Europeans and nearly 700 Africans employed on the site. Interviewed in Salisbury on July 28, the chairman of the Federal Hydro-Electric Board, Mr. D. L. Anderson, said that, in the field, the Cementation Company was expanding its labour force and plant needed for the construction of cofferdams, diversion tunnel and flood by-pass. Additional exploratory work in the form of shafts, boreholes and access galleries was proceeding on both banks of the river to finalize the detailed designs. The work proceeding on the South Bank was most advanced. No material evidence of a geological nature had come to light as a result of these investigations,

to alter or affect the general design of the arch dam and underground power station as they were envisaged in the original plans. Access roads were under construction on the site by the Cementation Company, and an access road was being constructed between Makuti and the site by the Irrigation Department. Good progress had been made with this work.

It has been estimated that the drop in the price of 3d. a bag of cement recently announced by cement companies in the Federation, will mean a saving of £80,000 in the estimated cost of the Kariba scheme. The construction of the dam will involve 300,000 s.tons of cement.

Southern Rhodesia's smallworker gold miners who are at present facing the bleakest period in the history of gold mining in the Colony, now see as their main hope for the future the provision of cheap power from Kariba. In 1937 it was possible to start a mine with about £1,000 capital but to-day it is estimated that an equivalent operation costs from £10,000 to £20,000 before the production stage is reached. In the same period the number of mines operating in Southern Rhodesia has dropped from 1,707 to 381. Electricity, in particular, has risen in price. In the past few years it has been estimated to have gone up by 40 per cent and the cost of transmission lines has increased from £75 a mile to £200 a mile.

Meanwhile, the future role of the Anglo American owned collieries at Wankie is causing speculation. Notwithstanding the certainty of development of hydro-electric power at Kariba, production at Wankie is undergoing rapid expansion. It has had no alternative but to go ahead, as it is the sole source of supply in the Federation of coal and coke which all three territories, and particularly the Copperbelt, require. During the past five years the European population at Wankie has increased from just under 1,000 to 2,800 and the Native population from about 15,000 to more than 20,000.

A large new hospital has been provided, nearly 300 additional houses have been built, roads have been tar-macadamized, the capacity of the power generating and transmission system has been increased considerably, and a pipeline has been installed between Wankie and the Zambesi River. In addition, a completely new colliery has been developed and commissioned.

It is generally conceded that when the company's pro-

gramme is completed within the next two years, the coal and coke industry of the Federation will be on an extremely sound basis. But a point which is being debated is what will be the role of Wankie when the Kariba hydro-electric scheme comes into operation.

The Mining Industry in Cyprus during 1954

The Annual Report for 1954 of the Inspector of Mines of Cyprus lately has been received, and points out that the firm demand and reasonably stable prices received over the past few years for most of the mineral products of the island were reflected last year in increased production from the steadily expanding mining industry. Under similarly favourable conditions a slight increase in exports of copper and sulphur-bearing products can be expected during the next three years, as at the end of 1954 the Limni treatment plant of the Cyprus Sulphur and Copper Co. Ltd. was brought into operation, and orders had been placed by the Hellenic Mining Co. Ltd. for the necessary equipment to allow for the transfer of the company's main operations to the Mitsero Agrokipia area. Indeed, extensive prospecting operations in the latter district during recent years have disclosed sufficient reserves of iron pyrites to warrant the installation of a modern treatment plant of 720,000 tons per annum throughput.

The increasing importance of the mining industry to the economy of Cyprus is apparent from the fact that the value of mineral products exported last year amounted to £9,575,621, or 59 per cent of the total value of all exports. Record tonnages of copper concentrates at 93,610 valued at £3,686,369 and iron pyrites at 687,954 valued at £3,338,223 accounted for 73 per cent of the total value of mineral products exported. The other principal mineral products which contributed to the total value were 125,370 tons of cupreous pyrites valued at £1,004,226, some 18,163 tons of asbestos valued at £868,668, as well as 3,600 tons of cement copper to value £409,516 and 9,006 tons of chromite valued at £139,613 and 98,540 tons of gypsum valued at £84,789.

Direct revenue from mining operations amounted to £59,742 compared with £46,987 in 1953, and the amount of money expended in the Colony by the major mining companies exceeded £5,000,000 not including total income tax paid.

The average labour force was 6,611 and the Geological Survey Department continued the detailed mapping of the igneous rocks in which the known orebodies occur. A provisional map of the Troodos section has been prepared. At the close of the year 12 mining leases and six mining licences covering an area of 156 sq. miles were in force, in addition to three quarry licences covering an area of 7½ sq. miles.

Much prospecting activity was reported by the mining companies operating in the island, notably the Hellenic Mining Co. Ltd. and Cyprus Mines Corporation. Prospecting for oil by the latter producer met with little success. It is reported that although increased mechanization resulted in an appreciable reduction in the number of persons employed at Amiandos Mines Ltd., the increased activities of Hellenic Mining and Cyprus sulphur and copper absorbed more labour with the result that the labour force remained static in so far as numbers were concerned.

Nuclear Development within the Commonwealth

A report entitled *The Commonwealth and Nuclear Development* prepared by the Central Office of Information, describes the part played by the United Kingdom and countries of the Commonwealth in the development of nuclear energy. The report is published this week by H.M. Stationery Office at 2s. net.

The stage has now been reached where the countries which pioneered nuclear energy research are emphasizing the development of its peaceful applications. These uses consist principally of the application of the heat produced from fission in nuclear reactors to electric power production as well as the production of radioisotopes. Indeed, the United Kingdom stands as the chief exporter of radioisotopes in the world, producing approximately 20,000 last year of which 7,252 units or 54 per cent by value of total shipments were exported. The United Kingdom thus exported more radioisotopes than all other countries combined, an important factor in the sales being the reasonable price of the product and its convenient size. The use of radioactive isotopes is expanding in industry, as is the realization of their possible effectiveness in research and control.

In so far as the provision of electrical power is concerned, it is estimated that nuclear power station capacity installed by 1957 might approximate to 10,000 or 15,000 megawatts. This production means the saving of about 40,000,000 tons of coal a year, but the estimated date depends in some measure upon a reasonably speedy mastery by industry of the necessary techniques. One interesting aspect of the developments in this field is that the United Kingdom aids other countries with their research and development programmes and trains their scientists and engineers at Harwell, so that eventually she should be able to export entire nuclear power stations to a world hungry for power. A new industry has grown up around these projects and more than 150 firms have either undertaken work for the U.K. Atomic Energy Authority or are manufacturing nuclear instruments.

The report concluded by describing the progress made in member nations of the Commonwealth, notably Canada, whose most significant contributions to the present are the possession of actual and potential supplies of uranium and other materials necessary for nuclear development.

U.S. Capital for Australian Uranium Development

The increasing tendency of the United States to extend its interests in uranium production in an endeavour to ensure future supplies from friendly nations has been re-emphasized by the introduction of American capital into Australian uranium mining operations.

Atlas Corporation of U.S.A. has entered the interests of North Australian Uranium Corporation with an investment of £A562,000. The immediate objective is the prospecting of the Corporation's area of 700 sq. miles on the South Alligator River, a small portion of which has already been examined with reported satisfactory results. The Corporation also holds an area of promise and size in the Slesbeek find.

A second group of potential importance is United Uranium N.L., which operates for Uranium Mines and Northern Uranium Development. It is also interested in this field and attention is directed to its El Sharana lease on the South Alligator River, which is considered to be the best surface prospect so far discovered in Australia, and on which some 750 tons per vertical foot, worth 0.5 per cent uranium oxide has been indicated by preliminary work.

In both cases, much exploratory work must be done to establish ore reserves that will warrant a treatment plant, or plants. This aspect will be very important, for a balance must be struck between the cost of transport over long distances, and the high cost of uranium treatment plants. At present the Rum Jungle plant is the only one operating in the Territory and the distance of cartage will prove prohibitive from further-out occurrences, so that the economics of large and distant deposits call for careful consideration, before a decision is made on plant construction.

Western United States

(From Our Own Correspondent)

Portland, Oregon, August 1.

On June 21 President Eisenhower signed the bill extending the Reciprocal Trade Agreements act for three years. This gives the President authority to cut tariffs a maximum of five per cent a year but allows an industry which can show that it is being affected adversely to petition for an increase. Mr. Clarence B. Randall, who headed the President's Commission on Foreign Economic Policy in 1953 expressed the opinion that the new law may lead directly to free convertibility of foreign exchange.

The two senators from Arizona have introduced legislation to purchase for the stockpile not less than 200,000 tons of lead at not less than 16 c. a lb. and 300,000 tons of zinc at a minimum of 15.5 c. Metals must be from domestic mines and purchase would be at a monthly rate of 10,000 tons for lead and 15,000 tons for zinc. The combined price proposed is half a cent more than that which the national committee of the lead and zinc industry estimated last year as necessary to ensure continued operation.

LABOUR UNREST

On July 1 the Mine, Mill and Smelter Workers' Union called a strike against Kennecott Phelps-Dodge and American Smelting and Refining. Anaconda was not immediately affected as its contract still had a short time to run and before its expiration the company and the union got together in a new agreement which is expected to set a pattern for negotiation with the other three companies. At last reports, little progress had been made by the others of the "Big Four".

The strike action was expected, as it was known that the union was only awaiting the outcome of negotiations of the automobile workers for a guaranteed annual wage. With the partial success of the latter, Mine-Mill made demands on the copper companies for an increase of 30 c. an hour. Settlement with Anaconda is reported to have been on a basis of 11½ c. per hour increase and some statements from Mine-Mill leaders have indicated that they would accept a basic increase of 10 c. Meantime approximately 50,000 workers are idled and the strike, coming before supply had recovered from the shortage caused by the strike of last year, has imposed a severe hardship on consumers. Some of these have shut down and others have cut down production. Revere has laid off 5,300 men and Chase 2,000. Other fabricators are reported as paying as high as 50 c. per lb. in order to maintain production. It is estimated that the closing of A.S. and R. plants resulted in a loss of 25,000 to 30,000 tons of lead to the market during July.

Before the strike was called O.D.M. had authorized the diversion of 16,000 tons of copper to private industry to relieve the shortage already existing. It is questionable if any further such move will be made until the strike is settled. Last year O.D.M. refused to make such a diversion while the strike was in progress as it was feared that it might be construed as strike breaking. As this was being written word was received that Phelps-Dodge had reached an agreement with the union but terms are not known yet.

On July 28 the Attorney General started action before the Subversive Activities Control Board to have the union declared to be communist-controlled. This action is the first of its kind undertaken under a recent law (1954) and, if successful, would deprive the union of all its rights before the National Labour Relations Board. While this move by the Attorney General has been expected for some time,

coming as it did the union has used it as propaganda and alleges that the purpose is to break the strike in the copper industry.

Mine-Mill has granted its Canadian branch complete autonomy from the parent organization. This is interpreted as indicating that the officers realized that it could not hold the Canadians in line and that the latter would have seceded had the concession not been made.

A.E.C. PRICE SCHEDULE

Anaconda Copper Mining Co. has officially changed its name to The Anaconda Co. The action was taken in view of the fact that the company has so diversified its interests that the former name was no longer descriptive. In Arizona Anaconda's subsidiary, Inspiration, has embarked on an extensive remodelling and modernization plan which will include complete rebuilding of the concentrator and increasing its daily capacity to 16,000 tons. This will involve a dual process in which the ore is first leached and then concentrated. It is expected that the lower cost and better recovery thus obtained will increase reserves of recoverable copper by 175,000 tons. The new programme calls for an investment of \$3,500,000.

A.E.C. has signed a contract with Mines Development, Inc., of Denver, for construction and operation of a uranium processing mill for treatment of ores from South Dakota and Wyoming which have been accumulating in a government stockpile at Edgemont, So. Dakota, since 1952.

At latest reports bonuses paid for the first 10,000 lb. of U₃O₈ produced from new properties exceed \$5,000,000. These bonuses double the base price for the ore and have been paid to a total of 538 properties. Perhaps a brief explanation of the price schedule set up by A.E.C. which has been so successful in stimulating production of uranium ore will be of interest. The lowest grade accepted is 0.10 per cent U₃O₈ (2 lb. per ton). This is given a base price of \$3.00 per ton or \$1.50 per lb. As the content of the ore increases the price paid increases disproportionately so that ore carrying 0.20 per cent has a base price of \$14.00 per ton. Above this grade a premium of 75 c. per lb. of U₃O₈ is paid and ore assaying more than 0.5 per cent receives an additional premium of 25 c. per lb. Then there is an allowance of 50 c. per lb. for reimbursement of development costs and, as noted, on the first 10,000 lb. of U₃O₈ shipped, there is a bonus equal to the base price of the ore. Assuming the latter applied, an ore carrying 1 per cent would receive a base price of \$70.00, a premium for grade of \$14.50, a development allowance of \$10.00 and an initial production bonus of \$70.00, a total of \$164.50 per ton. In addition to the above there is an allowance for haulage from the mine to the purchasing depot which is adjusted to the individual case.

Mr. Floyd Odlum, head of Hidden Splendour, which includes the group of claims purchased from Vernon Pick for \$8,500,000, is negotiating with A.E.C. for permits to build mills in the vicinity of Green River and Moab, Utah. Mr. Odlum states that serious consideration is being given to using nuclear power for these mills. While this may appear to be "jumping the gun" it is obvious that an operator who could produce the raw material for manufacturing the nuclear fuel for such a plant would be in an advantageous position.

Meantime construction has been commenced by the Uranium Reduction Co. on a mill at Moab which will be the largest in the Plateau area when completed. It will use a new process recently developed by A.E.C. and will be operated by American Zinc, Lead and Smelting Co., one of the organizers of Uranium Reduction. This will be the eleventh mill in the Plateau area.

Geophysical Exploration in the United States

The major effort of the United States Geological Survey has been directed towards a study of rock formations in relation to the needs of the mining industry, and investigations are usually concerned with the development of new fields rather than with the location of specific orebodies. In most instances geophysics is used to supply the data which provides a better understanding of geological environment where existing surface expression is inadequate. These methods are described in the following article by J. R. Balsley, of the geophysics branch of the U.S. Geological Survey, condensed from a paper entitled *Geophysical Exploration Programme of the U.S. Geological Survey*, published under the authority of the Survey and presented at the Centenary Congress of the Société de l'Industrie Minérale, held in Paris during June, 1955.

The geophysical work of the Geological Survey can be divided into three categories. The first is essentially research and consists of investigations of the physical properties of earth materials and the expression of the physical forces existing within or imposed upon the earth and their relationship to geological factors such as structure, lithology, and mineralogical or chemical composition.

The second group of projects involves the application of the principles developed in research to large-scale projects of the Geological Survey, while the third group involves the application of the established geophysical principles to the solution of immediate or specific problems, in particular on short-term projects, or on projects of limited scope.

PROPAGATION OF RADIO WAVES

One of the most recent and potentially productive studies undertaken by the survey has been in the highly controversial field of the propagation of radio waves through earth materials. Despite the numerous experiments indicating that radio waves cannot penetrate far enough into the earth to be of much value in geological exploration, there are perennial reports of the use of radio waves to study geologic structures at great depths within the earth.

In an attempt to dissipate this uncertainty, a research programme was undertaken to measure the dielectric and conductivity characteristics of earth materials at intermediate and high frequencies. Laboratory measurements were made on a group of cores collected in their natural state from various formations in the Colorado Plateau. These measurements showed that the propagation of radio waves was not anomalous and that it followed all the established physical laws.

In addition, it was found that where a bed of low conductivity and low dielectric constant lay between beds of high conductivity and high dielectric constant, the bed acted as a cylindrical wave guide and the radiated field fell off as the sq. root rather than as first power of distance.

Development of the airborne magnetometer for geophysical use and the shallow reflection seismic equipment is research of a different kind. The reflection method is generally more accurate than the refraction method for determining the depth to a particular horizon or surface, but in the past it has not been used for depths shallower than about 1,000 ft. because at these depths the reflected shock wave cannot be separated from the shock wave travelling directly through the surface materials and because the wave length of the low-frequency energy usually measured is too long to provide adequate resolving power. By changing the instrument so that the direct energy is quickly suppressed and by recording only the high-frequency energy with short wave length it is now possible to measure reflections from horizons as shallow as 50 ft.

In an aeromagnetic survey in the Adirondack Mountains, United States, undertaken to locate magnetite deposits, negative

magnetic anomalies were found. Study of a group of specimens showed that the permanent magnetization of these rocks was in a direction opposite to that of the earth's field.

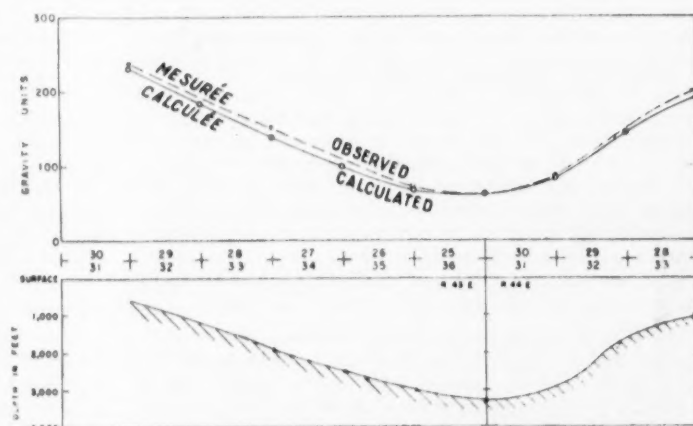
WORK ON THE COLORADO PLATEAU

One of the best examples of the integration of geology and geophysics in the search for minerals is the intensive work currently being conducted on the Colorado Plateau. Most of the uranium ore deposits in the Colorado Plateau, are found in essentially flat-lying Jurassic and Triassic sandstones. This section has been intruded by basaltic stocks, laccoliths, dykes, and volcanic necks. Most of the deposits of uranium appear to be associated with rolls, which are lenticular or cylindrical structures within the sandstone.

The objective of one part of the geophysical programme in this area is to gain a more complete understanding of the major geologic structures and their relationship to these districts. The objective of the other part of the programme is to develop, evaluate, and apply geophysical prospecting methods as an aid in the exploration for specific uranium ore deposits.

The regional work consists of an aeromagnetic survey of approximately 20,000 sq. miles, and reconnaissance gravimeter surveys of about 4,000 sq. miles. Both gravity and magnetic surveys have been highly successful in determining the shape of exposed intrusive masses and in locating buried igneous rocks.

The resistivity methods which measure the ability of the earth's materials to conduct electricity, have been successful in locating the thick parts of the Salt Wash sandstone member of the Morrison formation on the Colorado Plateau, because the electrical properties of the thick parts are slightly different from those of the rest of the formation. These methods do not directly locate ore deposits, but the data can be used to indicate areas most favourable for mineralization and, as such, can be used to guide the



Comparison of calculated and observed gravity and seismic depth profile. Results are correlated from reflection stations.

exploratory drilling operations undertaken.

The most successful geophysical method on the Colorado Plateau in the search for ore-bearing structures is the seismic refraction method, which has proved to be highly successful in locating the buried stream channels cut into the shales and mudstones of the Moenkopi formation in which the seismic velocity is relatively high. By routine surveys, it is possible in this way to locate these channels, determine their trends, and guide drilling operations. The only geophysical instruments that have been successful in directly locating uranium deposits are the gamma-ray detectors, either Geiger counters or scintillation counters.

Although the programme in the Colorado Plateau has certain unique characteristics, it indicates the typical approach of the Geophysics Branch, in that the least expensive reconnaissance surveys are employed, particularly those made in the aircraft; second, the detailed geophysical examinations to determine subsurface geological structures and in some instances to locate ore deposits.

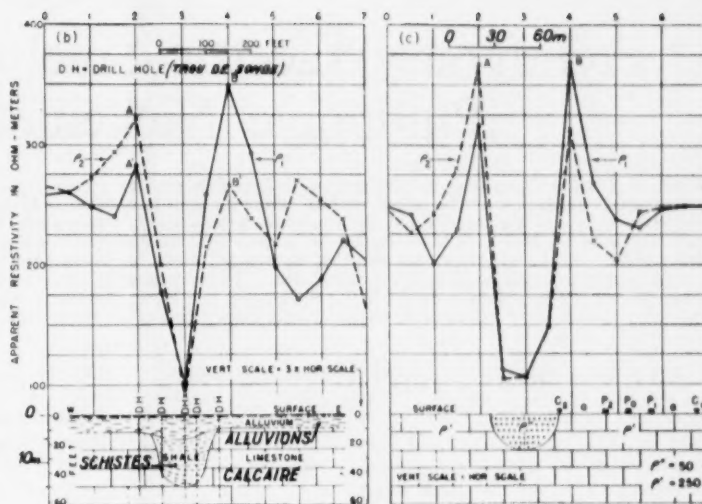
In the Mojave Desert in Southern California, geophysical exploration techniques have been used to guide investigations of saline deposits that lie in Tertiary basins between the scattered hills and mountains of Jurassic metamorphic rocks. Standard seismic methods can be used to determine accurately the configuration of the basement surface, but these methods are expensive. Because sedimentary rocks and alluvium are less dense than the Jurassic basement rocks, gravity surveys can be used to locate the major basins in the district. The reliability of gravity measurements to determine basement configuration in this area is demonstrated by the close agreement between the observed gravity anomaly and that computed from the basement profile determined from seismic surveys. To locate all the major basins in an area of about 5,000 sq. miles, about 3,000 gravity stations have been occupied.

LONG RANGE STUDY IN USE OF GEOPHYSICS

The results and experience gained in these surveys are being applied in a long-range study of the use of geophysics in the Great Basin including a large section of our Western United States. In this area, which contains some of the major mining districts of the United States, exposures are generally good in rugged mountains, but are non-existent in the wide alluvium-filled valleys. In the Tri-State lead-zinc mining district in the central part of the United States, geophysics has been used successfully to locate the structures in which the ore deposits are found. These structures have been produced by the solution of limestone of Mississippian age. This solution has resulted in collapse of the limestone and slumping of the overlying Pennsylvanian shale.

The resistivity of the underlying limestone is about 150 ohm-meters and that of the shale about 30 ohm-meters. This striking contrast in resistivity produces low-resistivity anomalies in the slump areas. Theoretical studies have shown that characteristic anomalies are associated with typical slump structures and that by making careful surveys it is possible in most instances to locate the edge of the structure to within half the station spacing.

These surveys were made using the Lee configuration in



Comparison of theoretical and observed horizontal resistivity profiles over filled sinks.

which two current electrodes, C_1 and C_2 , and three potential electrodes, P_1 , P_2 , and P_3 , are moved as a group along the profile, and the apparent resistivities P_1 and P_2 are measured between electrodes P_1 and P_2 and between P_1 and P_3 , respectively. In analyzing the profiles it is not only important to consider the general level, but also the relationship of the two profiles. A characteristic sharp peak is found close to the contact of the shale slump, and the apparent resistivity peak given by the potential electrode outside the slump is always higher than that given by the potential electrode within the slump area.

The slumps or sinks have also been detected by seismic refraction surveys because the fractured material within the slump transmits the seismic waves at a much slower velocity than the underlying limestone. Obviously the resistivity method locates the important feature—the edge of the slump—with more accuracy than the seismic method.

APPLICATION OF RESULTS FROM AEROMAGNETIC SURVEYS

Aeromagnetic surveys have been very useful in geological investigations in the Lake Superior iron and copper districts. By using the magnetic results as a network of trends to which the sparse outcrop information can be related, geologic maps have been prepared with much greater accuracy than has been heretofore possible.

The same approach has been used in the Keweenaw Peninsula where tilted pre-Cambrian basalt flows produce large anomalies. The copper deposits are localized in flow tops or certain basalts, and by tracing the basaltic structures, areas favourable for prospecting are revealed.

An interesting and perhaps economically important project has developed from the practice of recording the total magnetic intensity as the surveying aeroplane flies point to point between projects.

These few examples illustrate the function of the Geophysics Branch in attaining the objectives of the Geological Survey. As far as possible we attempt to broaden the use of geophysical techniques in the search for mineral deposits by developing new instruments, by testing the application of all techniques in different geologic environments, and by using these techniques where they are required to solve geologic problems.

Preliminary Electric Smelting Research on Philippine Nickeliferous Ores

Under a Foreign Operations Administration Technical Assistance programme, the Philippine Bureau of Mines recently began a systematic investigation of the nickel content of the Surigao laterite areas to determine the occurrence, distribution and grade of nickel contained in the laterite and the subjacent serpentine. Simultaneously, a technical review of the possibility of producing commercial ferronickel from the nickeliferous materials in the Philippines was concluded. Early in 1954 the deposit was sampled for metallurgical investigation, and the U.S. Bureau of Mines Northwest Electrodevelopment Laboratory conducted preliminary electric smelting studies on nickeliferous serpentine and laterite samples. These studies are described in the following article, condensed from *Report of Investigations 5129*, by L. H. Banning and W. E. Anable of the Pyrometallurgical Branch, Metallurgical Division, Region I, of the United States Bureau of Mines and published by the Bureau.

The primary objective of the metallurgical investigations by the U.S. Bureau of Mines was to determine the electric smelting characteristics of the nickeliferous serpentine and laterite furnished under the FOA-TA programme. Other objectives of the metallurgical investigations were first, to determine the mineralogical composition of the ore samples and indicate any evidence that mineral beneficiation might be possible; and second, to prepare a report on the results of the investigations that indicate a method of utilizing the nickeliferous raw materials tested.

SEQUENCE OF TESTS

Samples of nickeliferous serpentine and laterite from the Surigao area on the island of Nonoc in the Philippine Islands were received at the Bureau Northwest Electrodevelopment Laboratory in June, 1954. The dried serpentine and laterite samples analyzed 1.89 and 1.84 per cent Ni and 8.47 and 22.8 per cent Fe, respectively. After calcining, the sample of serpentine weighed 3.8 tons; the Ni analysis was increased to 2.25 per cent and the Fe to 11 per cent. After calcining, the sample of laterite weighed 3.2 tons; the Ni analysis was increased to 2.20 per cent and the Fe to 26.9 per cent.

Two smelting tests were run on each lot of ore. In the first tests a very limited amount of reductant was used. Consequently, only 38 per cent of the nickel charged to the furnace was recovered in the ferronickel products. The alloy recovered from smelting the calcined serpentine contained 68.3 per cent Ni and 29.9 per cent Fe. The alloy product recovered from smelting the calcined laterite contained 37.4 per cent Ni and 61.6 per cent Fe.

The limited amount of ore was insufficient for developing complete smelting data.

Therefore the slags from the first tests were crushed, sampled, and re-smelted to determine the nickel recovery to be expected by electric smelting of these ores with enough reductant. Over 90 per cent of the nickel was recovered as low-carbon ferronickel. The alloys recovered from smelting the serpentine and the laterite slags contained 52.1 and 48.0 per cent nickel, respectively. The final slag products from these tests contained 0.21 per cent nickel.

TEST RESULTS

The overall results of the tests indicate that, when enough reductant is used in the furnace charge, approximately 93 per cent of the nickel can be recovered from these ores as a high-grade, low-carbon ferronickel product and that approximately 35 lb. of nickel can be recovered in a high-grade, low-carbon ferronickel product from each ton of dry ore smelted. Although no flux was added to the furnace charge, a fluid slag was readily tapped from the furnace. The slags were almost neutral and did not present a refractory erosion problem. No operational difficulties were experienced in smelting these samples.

The tests also demonstrated the feasibility of using

bagasse as a carbonaceous reductant for the selective reduction of these nickeliferous ore samples. The use of bagasse in electric smelting would be an effective outlet for this by-product of the Philippine Islands sugar-refining industry. This material, which is currently being largely wasted, is reported to be available in tonnage quantities.

SMELTING EQUIPMENT

The Northwest Electrodevelopment Laboratory is well equipped for conducting electric smelting research. In addition to two roofed melting and refining furnaces and other necessary auxiliary equipment, the laboratory has two open-top, 3-phase, electric smelting furnaces. The larger smelting furnace uses 6- or 8-in. graphite electrodes at electrical energy inputs of 400 to 1,000 kW. The smaller furnace uses 3- or 4-in. electrodes at electrical energy inputs ranging from 100 to 400 kW. The electrodes of these furnaces are controlled automatically by a newly installed mechanism.

However, only the smaller furnace was used to make the smelting tests on the materials received from the Philippine Islands. The shell for this furnace has an inside dia. of 50 in. and a height of 46 in. It is lined with one course of magnesite arch brick. The dia. inside the refractory is 41 in., and the crucible depth is 33 in. Coils of water-cooling pipe, which had been tack-welded to the shell for a previous test on a siliceous nickel ore, were used.

TREATMENT OF SAMPLES

The serpentine and laterite samples contained 24.9 and 34 per cent moisture respectively. These materials were dried in a rotary drier, stage-crushed to minus- $\frac{1}{8}$ in., and sampled with an automatic sampler. The cobalt content was reported to be less than 0.02 per cent. Examinations of the ore samples by the Albany petrographic laboratory revealed that both samples were basically similar except for the degree of alteration.

The nickeliferous laterite sample consisted essentially of highly weathered and altered fragments of nickeliferous serpentine, with some associated limonite and a relatively small amount of chlorite. Also present were small amounts of magnetite, chromite, talc, quartz, and altered olivine. The fragments were coated with a very fine grained mixture of limonite, serpentine, and other associated minerals. The olivine was altering to serpentine. No discrete nickel minerals were observed.

The nickeliferous serpentine sample consisted essentially of weathered and altered fragments of nickeliferous serpentine, with some associated limonite and relatively small amounts of olivine and chlorite. Also associated were small amounts of magnetite and chromite and a trace amount of magnesite. This sample was basically similar to the laterite sample, except for the degree of alteration. No discrete nickel minerals were detected, and spectroscopic examinations of selected fractions of the material indicate

that nickel was well dispersed throughout the entire sample. As in the laterite sample, the nickeliferous serpentine apparently accounted for the bulk of the nickel present.

On a previous occasion bagasse, a by-product of the sugar-refining industry, had been used with some success in smelting chromite concentrates. Large tonnages of bagasse are reported to be available in the Philippine Islands, and bagasse was thought to be a desirable reducing agent to use in the experimental smelting of Philippine nickel ores. Sixty-eight bales of bagasse were procured from the Valentine Sugar Co. for these and other smelting tests. The baled bagasse was broken by hand and fed to the Pennsylvania impactor for shredding.

The moisture content of the baled bagasse was quite uniform compared to hogged-wood waste, which is normally used in smelting investigations at Albany. The comparatively drier bagasse also has a much lower weight per unit of volume than does hogged-wood waste. The carbon content of both materials, however, is about the same on a dry basis.

SMELTING PROCEDURE

The minus $\frac{1}{2}$ in. samples of serpentine and laterite were calcined in the rotary kiln. Each calcined-ore sample was bedded in successive layers in a separate crib in the smelter building. The furnace charge was made up of ore from the face of the crib and bagasse. After weighing, the charge components were mixed in a 6 cu. ft. concrete mixer. After mixing, the charge was loaded into a charge bucket, hoisted to the charge deck, and dumped adjacent to the furnace.

Before a test was begun the magnesite-furnace refractory was tempered by melting 270 lb. of ferronickel on the hearth, and then covering the molten alloy with a neutral lime-silica slag. Short arcs were maintained for 8 hours with enough power input to keep the pool molten. This ferronickel was then drained from the furnace while electrical contact was maintained by continuous arcing on the layer of slag remaining in the furnace. The test was begun by feeding charge around each electrode. Later, charge was fed around the periphery of the furnace until a molten pool formed in the delta between the three electrodes. Once a steady operation was attained, enough charge was banked against the wall of the furnace to cause it to roll down the steep incline and gradually to cover the molten pool between the electrodes. A shallow, dry top, 6 to 10 in. deep, was maintained on the molten pool at all times. An arc-resistance smelting technique was used throughout the test.

Slag was tapped from the upper taphole at intervals of about 1 hour. The ferronickel was tapped from the drain taphole at the end of each 8-hour shift.

Ferronickel and a small amount of slag were tapped from the drain taphole into a 12 in. diameter ladle, the supernatant slag was decanted into a conical cast-iron mould, and the alloy was poured into cast-iron pig moulds. Each alloy pig weighed about 35 lb. The alloy pigs were sampled by drilling the centre pig of each pour.

TESTS ON CALCINED ORES

Usually a fluid slag can be produced without adding flux to the furnace charges when smelting nickeliferous serpentine and laterite ores. Analyses and calculations indicated that a fluid, nearly neutral slag could be produced by smelting these Philippine nickel-ore samples without using flux.

Calculations indicate that it is necessary to use 1.4 lb. of carbon per 100 lb. of calcined serpentine and 3.2 lb. of carbon per 100 lb. of calcined laterite to produce ferronickel products containing 40 per cent nickel. In these calculations

it was assumed that the consumption of electrodes would be 10 lb. per ton ore smelted and that this carbon would be used effectively in the reduction reaction. Four and one-half lb. of bagasse, equivalent to 0.954 lb. of carbon, was used per 100 lb. of calcined serpentine; and 9 lb. of bagasse, equivalent to 1.908 lb. of carbon, was used per 100 lb. of calcined laterite. This deficiency of carbon resulted in the production of a high-nickel, low-carbon ferronickel product and ultimately, low recovery of the nickel.

The highest phase-to-phase voltage setting available, 220 volts, and an electrical energy input of about 200 kilowatts, were used when smelting the calcined serpentine. Smelting was very satisfactory under these conditions. An attempt to smelt the calcined laterite at the same voltage and electrical energy input resulted in unstable arc conditions and a drop in slag-tapping temperatures from over 1,600 deg. to 1,545 deg. C. By lowering the voltage setting to 135 volts and maintaining the electrical energy input at 200 kilowatts, satisfactory operation was again attained. After the voltage was lowered, the tapping temperatures increased to 1,605 deg. C., and the nickel content of slag samples decreased from 1.9 to 0.9 per cent.

The overall nickel recovery for this series of smelting tests was only 38 per cent, so the slag products from these tests were resmelted to determine the nickel recovery that can reasonably be expected from smelting these ores.

TESTS ON PRIMARY SLAGS

The slag product from smelting the calcined serpentine ore was resmelted, using 3 lb. of bagasse to each 100 lb. of crushed slag. The slag product from smelting the calcined laterite ore was resmelted, using 4 lb. of bagasse to each 100 lb. of crushed slag. Smelting these slag samples at the electrical energy inputs used successfully in smelting the calcined-ore samples proved effective and satisfactory. The electrical energy requirements were 875 kw.-hr. per ton of serpentine slag and 965 kw.-hr. per ton of laterite slag. Graphite-electrode consumption averaged 9.5 lb. per ton of slag smelted.

Calculations indicate that 90.2 per cent of the nickel contained in the primary slag was recovered. The nickel recovery attained in both smelting steps is calculated to be over 93 per cent.

CONCLUSIONS

Results of these preliminary smelting tests on nickeliferous serpentine and laterite samples from the Philippine Islands indicate that it is feasible to produce a commercial low-carbon ferronickel product from these materials. The tests also demonstrate that bagasse, a byproduct of the sugar-refining industry, is a satisfactory carbonaceous reductant for this operation.

The absence of cobalt in these ores is advantageous, since, if present, it will follow the nickel in smelting but will not improve the quality of the ferro-nickel. It is also noteworthy that the slags from smelting these samples were nearly neutral. No serious furnace refractory problems would be expected when smelting these ores in a continuous operation.

The test results indicate that the electrical energy requirement for smelting calcined serpentine ore on a commercial basis would be less than 900 kw.-hr. per ton. The indicated electrical energy requirement for smelting calcined laterite ore would be about 10 per cent higher. The graphite electrode consumption should not be over 10 lb. per ton in either case under proper electrical and operational conditions. The efficiency was calculated to be about 4 per cent. Apparently, there would be no major difficulties in the electric smelting of these materials on a commercial scale.

URANIUM—II

Economics of Nuclear Power Production

The economics of atomic power generation appear to have been altered radically by the development of breeder reactors. The following article, the conclusion of two instalments discussing uranium in its function of atomic mineral, assesses the possible economic structure of nuclear power production and points out that in the long run the extent to which nuclear fission may be expected to supplant the more traditional sources of energy will be limited, not by the availability of nuclear fuels, but by closely linked technical and economic considerations.

In the latest O.E.E.C. report it is stated that the cost of building nuclear power stations ranges between \$300 and \$400 (depending on the scheme) per kW. of installed capacity. Some recent projects in the U.S. mention the figure of \$250 per kW. The average cost of the traditional type of plant in O.E.E.C. member countries is \$180 per kW. for thermal and \$270 per kW. for hydro stations. The view is expressed that the cost of nuclear plant will probably settle down in the near future somewhere between thermal and hydro costs.

The report quotes the estimated cost per kWh. of 0.6d. (i.e., seven millidollars) given in the United Kingdom White Paper, and points out that this figure is lower than the average cost of generating thermal power in Britain, but is not less than generating costs in an up-to-date power station fired by coal or fuel oil. Nuclear fuel costs are expected to range somewhere between 1.5 and 2.6 millidollars per kWh.; this is much cheaper than fuel for the traditional type of thermal plant, which averages about eight millidollars per kWh. in Europe. The U.S. is planning large-scale development for atomic energy in the hope that power can be produced at prices competitive with that produced from traditional sources, although the latter is distinctly cheaper than in Europe. There is no reason why Europe and the United States should not have atomic energy at the same price.

On the other hand, provisional programmes may prove too optimistic. The stations may take longer to design and build, they may cost more, and the amount of development work needed may have been underestimated. Nuclear power would then come later or be more expensive than present indications suggest.

It should also be pointed out that the cost of atomic energy does not depend on where it is produced. Thus the development of nuclear power may profoundly alter economic geography, since it will no longer be necessary to concentrate large industrial concerns around particular natural sites; such as coalfields, large-scale hydro schemes. This consideration has implications which are particularly important for countries which are under-developed, owing to the lack of power supplies.

SUMMARY AND CONCLUSIONS

The quantities of potential energy represented by known or estimated reserves of uranium and thorium are very much higher than the known reserves of coal. Production in the "moderate" cost range (less than \$12 per lb.) could supply the power industry for many years. Looking further into the future, uranium resources can be greatly expanded at a cost range between \$12 and \$30 a lb. If, in the more distant future, a cost between \$30 and \$50 a lb. could be considered, vast low-grade deposits would become sources of production.

In the long run, therefore, the extent to which nuclear fission may be expected to supplant the more traditional sources of energy will be limited, not by the availability of nuclear fuels but by technical and economic considerations, which are closely linked.

For many years atom power plants will only be economic

in the United States in situations where large power demand is combined with high fuel costs, as in New England. Nevertheless, prospects in the U.S. are considered sufficiently encouraging to warrant a large programme of nuclear development. It is noteworthy that the A.E.C. expects to sell atomic-produced power this summer—two years earlier than was expected. In Europe, where the cost of conventional power, generally speaking, is higher than the U.S., prospects are correspondingly more favourable. In many underdeveloped countries power is comparatively dear and nuclear energy would be competitive from the start.

The cost of producing a kWh. by atomic power will most probably be about 6d. during the next two years, diminishing thereafter as economies are effected by continued technical progress in ore dressing, reactor design and operation, the chemical processing of spent fuel elements, and ancillary operations.

PREDICTIONS OF USAGE

Providing that development programmes proceed broadly according to plan, it can be anticipated that within twenty years a large proportion of the power used in the United Kingdom, the U.S., and presumably other countries in Europe and elsewhere, will be derived from nuclear fuel—mainly uranium.

Increasing quantities of uranium are also likely to be required for research in nuclear physics and for the further expansion which can confidently be predicted in the demand for radioactive isotopes for scientific and industrial purposes.

The development of breeder reactors, by enabling nuclear fuels to be used more efficiently, should further assist in bringing down the cost of atomic power. The consequent reduction in the quantity of uranium consumed per kWh. would presumably be counterbalanced by a widening of the fields in which nuclear energy is able to compete.

The possibility that lithium might eventually replace uranium as an nuclear fuel, due to the introduction of a fusion process, can by no means be dismissed but at this stage appears to be still remote.

Prospecting and mining development on any appreciable scale are essentially long-term projects calling for considerable faith on the part of management and investors. At this stage the coming of the Atomic Era must still be taken on trust.

During a discussion on nuclear fuel requirements for the atomic power programme, Mr. Johnson forecast that by 1980 the world would require 14,000 tons of uranium and that 17,000 tons would be available by that date on the basis of present knowledge of Free World Supplies. The context suggests that this estimate was not concerned with military programmes and might even have excluded other commercial applications such as the production of radioactive isotopes.

On this assumption, it seems highly improbable that the uranium industry will be faced with any prospect of overproduction in the foreseeable future.

Development of Mount Lyell, Tasmania

The Mount Lyell Mining and Railway Company Limited has passed through a troubled history to reach the position it now holds amongst the producing mines of Australia. This story is told in *The Peaks of Lyell*, by Geoffrey Blainey, published by the Melbourne University Press. The following article presents a brief synopsis of the work which includes interesting matter on all aspects of mining enterprise. The book is well illustrated and costs 30s. net.

The Mount Lyell Mining and Railway Company produces approximately 9,000 tons of copper per annum and has an eventual target of 10,000 tons. The increased price of copper now in effect to producers is expected to offset generously the lower output recorded by the company this year, which for the first nine months has totalled 6,626 tons compared with 7,294 tons during the same period of 1953-1954. Yet despite the very considerable difficulties surmounted by the company throughout its working life, there are stated to be happier portents for the future; namely the brighter prospects in the open cut, the inauguration of a systematic prospecting campaign, the rapid expansion of Australia's market for copper, and improved mining and treatment practices that may allow the economic exploitation of lower grade ores.

GROWTH OF THE COMPANY

The mountainous country of Western Tasmania was originally prospected for gold and tin, while in addition veins of loose quartz were found impregnated with copper and iron pyrite close to the Mount Lyell area. The Iron Blow outcrop was pegged by the McDonoughs and Karlson in November, 1883, and in January, 1884, a first blast revealed no payable gold despite the fact that assays showed trace values. Nevertheless, one piece of ground 50 ft. sq. and sluiced to a depth of less than 4 ft. yielded over 100 oz. of free gold.

At this point in the history of the company the Mount Lyell Prospecting Association was formed. Surface gold was found in some quantity, and legal bickering between the partners is recorded. In 1887 the Association established its office in Launceston and the first board of directors was formed. This body consulted Dr. J. R. Robertson, a Sydney geologist who, after examination of the property, advised the directors that Mount Lyell ore was poor in gold and silver. He advised the directors to search for ore at depth. His report contradicted that of the Government Geologist.

In 1888 the Prospecting Association was dissolved and the Mount Lyell Gold Mining Company formed with 31 shareholders. Following excessive expenditure on machinery and plant, the directors resolved to wind up the company in May, 1891. The advice of Dr. Robertson had been disregarded.

The Tasmanian mining boom was once more boosted by the discovery of silver at nearby Zeehan, although no payable ore was found below 600 ft. depth. In 1891 William Orr, and Bowes Kelly of Broken Hill inspected the promising Zeehan mine in the company of Herman Schlapp, an American metallurgist. The "immense and puzzling" deposit at Mount Lyell was examined and sampled and Schlapp expressed the opinion that the find constituted a payable deposit of copper.

Despite the fact that the Zeehan boom collapsed in late 1891, Kelly and Orr bought a controlling interest in Mount Lyell for an eventual payment of £5,000. It is particularly interesting to note that although the Mount Lyell Gold Mining Company sold a gold property, Kelly and Orr bought a copper mine.

In 1892 the Mount Lyell Mining Company (No Liability) was formed in Melbourne. Plant was erected in Tasmania

and preliminary smelts completed, and in March of the following year, in order to interest the United Kingdom investor, the directors liquidated the old company and formed The Mount Lyell Mining and Railway Company Limited. In July, 1897, the company paid its first dividend after absorbing more than £400,000. It also completed the first railway to the Mount Lyell field.

The orebodies in different parts of the Lyell field are separated by millions of tons of barren rock, and at this period of the company's history the wide dispersion of copper, together with the diverse activities of the many small mining groups operating in the field, provided immense difficulties. One of these companies, the North Lyell mine, was situated 1,000 ft. above the Queen Valley, and when an access road was being cut to the property a rich bornite vein was intersected. This discovery added to the interest already being displayed in the area and fanned the rivalry between not only the mining companies but railway interests.

Eventually, however, the companies began to co-operate in their operational activities; the Mount Lyell Co. bought the Lyell Tharsis Mining Company and later merged with North Lyell, and The New Mount Lyell Mining and Railway Company was registered in Melbourne in August, 1903, with a share capital of £1,200,000.

THE MODERN ERA

Through the years up to and during the First World War, the Mount Lyell Co. became the second largest holder of ordinary shares in The Electrolytic Zinc Co. of Australia Ltd., and also played a conspicuous part in establishing the nearby Rosebery mills. Later it established a policy of systematic diamond drilling and metallurgical research, and the new techniques which revived Rosebery gave new life to Mount Lyell by the promise of copper extraction from millions of tons of schist rock too low in grade to be smelted economically in a blast furnace. In 1928 a tunnel was completed between mine and smelters, surface plants were later enlarged, a second power station was added to that already existing, and Mount Lyell was placed to the forefront of Australian mining fields.

Underground development operations concluded in 1938 showed that much of a new ore lode originally opened up in the old Russell tunnel at the Prince Lyell lease averaged 2.5 per cent copper and could be mined economically by open cut methods. Surface drilling above the Russell tunnel revealed a large area of copper-bearing ground, larger than the Mount Lyell mine in surface dimensions, and set beneath a thin overburden of peat and gravel. During the Second World War, however, once the available rich ore was exhausted, the open cut showed a decline of promise, as the average grade had fallen to 0.59 per cent.

It was concluded that the mine had a reserve of 34,000,000 tons of low grade ore averaging approximately 0.7 per cent copper and sufficient to ensure 20 years of operations. A policy of mechanization was therefore inaugurated, and in 1953 nearly five tons of waste were mined for every five tons of ore and £478,000 was spent in mining waste rock alone. In 1954, for the first time in 63 years, no underground mine was in operation on the Mount Lyell field.

New Force in Earth Moving

A representative of *The Mining Journal*, in company with other members of the United Kingdom technical press, visited the works of J. and H. McLaren—a member of the Brush Group—on August 9 to see the company's new diesel engine designated the L.E.6 which may well become a new force in the earth moving world. The engine is described in the following article.

The central purpose of a visit by members of the Technical Press to J. and H. McLaren of Leeds at the beginning of this week was to see a new engine—designated the L.E.6—designed by the company principally for the export market in the sphere of earth moving operations.

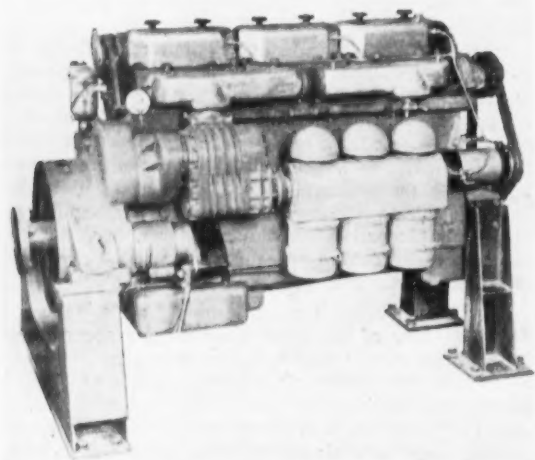
Indicative, perhaps, of the way in which British manufacturers are now assessing market outlets, J. and H. McLaren's accepted as basic data that the United States were in the van in the earth moving world. Accordingly the L.E.6 has been designed and produced to look and appear somewhat familiar to users accustomed to North American standards. The engine is fitted with S.A.E. mountings, unified threads, and can be fitted with American electrics thereby opening up a large additional potential market as replacement engines particularly in Canada and in South America—the two markets demanding high-speed diesels at the present time.

Yet it must be pointed out that although the L.E.6 is aimed chiefly at the earth moving market it is eminently suitable for rotary compressors, dual frequency generating sets and marine applications. Indeed, the company believes that rotary compressors will offer one of the biggest markets for the new L.E. range (which will be built in four and six cylinder forms, normally-aspirated and pressure-charged) when full production is achieved early in 1956.

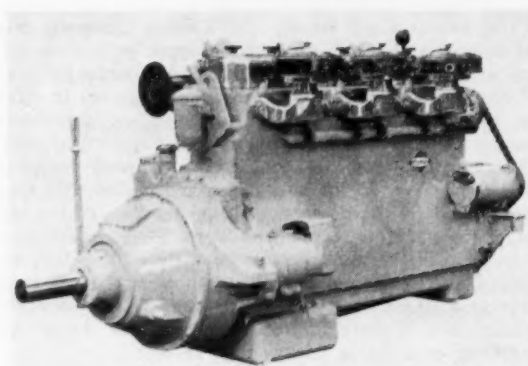
Combustion tests were begun on this engine five years ago and originally it was planned to build it as a fabricated structure. Subsequently, it was decided that the cylinder block should be of cast iron to reduce the overall length of the unit. The prime consideration during the construction period was to produce an engine of extremely simple design to meet the growing demand for inexpensive, compact, lightweight, high speed, low-consumption diesels.

DETAILS OF CONSTRUCTION

Additional to the aforementioned factors the principal advantages of the L.E. range of engines will be their ability to start instantly under all conditions as well as being completely reliable, a claim substantiated by the fact that no mechanical troubles have occurred during the extensive running-in tests on the pre-production model. Accessibility to all essential components has been achieved, thereby reducing maintenance tasks to a minimum. In this connection, one unique feature



Petter-McLaren L.E.B.6 (Supercharged) Diesel Engine.



Petter-McLaren L.E.6 Industrial Diesel Engine.

worthy of special mention is that the removal of the timing gear cover permits re-timing, camshaft removal or camshaft gear wheel removal without uncoupling from the driven machine or stripping the bellhousing and flywheel, despite the fact that the gear train is at the flywheel extremity. This positioning of the gear train aids in freeing the L.E. engine units from vibration. Another important point is that on both the four and six cylinder engines the crankshaft is exceptionally rigid and is fitted with balance weights. While this is common on a four cylinder engine it is not standard practice on a six cylinder unit.

TURBO CHARGED UNITS

Although the Technical Press had the opportunity to observe a supercharged version of the new engine which gave a 30 per cent increase in power with no increase in the overall dimensions, a turbo-charged version which the company hope to have running in about three months was not in view. But it is envisaged that when the L.E.6 complete with its exhaust gas turbo charger is ready a 50 per cent increase in power over the normal aspirated ratings can be expected.

Both the four and six cylinder L.E. units can be supercharged without any increase in overall dimensions to yield a 30 per cent increase in power. And J. and H. McLaren believe that any application which will accept the unblown engine at sea-level can be taken to high altitudes and still give a comparable output by the addition of the supercharger. For example, the L.E.6 engine will drive comfortably a 600 c.f.m. rotary compressor and when the blower is incorporated the output could be maintained at 10,000 to 12,000 ft. without any alteration to the compressor chassis being required.

The table below presents the power speed of the L.E. engine range on a 12 hour rating.

Type	R.P.M.	B.H.P.
L.E.4	1,000	66
Normally	1,200	80
Aspirated	1,500	100
	1,800	120
L.E.B.4	1,000	88
Supercharged	1,200	106
	1,500	130
	1,800	160
L.E.6	1,000	100
Normally	1,200	120
Aspirated	1,500	150
	1,800	180
L.E.B.6	1,000	133
Supercharged	1,200	160
	1,500	200
	1,800	240

METALS, MINERALS AND ALLOYS

COPPER.—There is now a very widespread conviction in the United States that the American producers' domestic price will have to be raised; there is only slightly less conviction that the new price will be 40 c. per lb. There are several pointers to this figure; one is that R.S.T.'s new fixed price approximates very closely to it, and another is that Union Minière du Haut Katanga is now charging the New York equivalent of nearly 38½ c. per lb. Revere Copper and Brass has also raised the prices of mill products to a level based on copper at 40 c. per lb. This figure of 40 c. must, of course, approximately represent the marriage of such supplies at the fixed price of 36 c. as are available and of scrap and dealers' metal which may be costing up to 50 c. per lb. If the domestic level of copper were to go up to 40 c. the result of such a marriage would be bound to exceed that figure. Scovill has, in fact, announced a new price list based on copper at 42 c.; Bridgeport Brass has raised its prices but is not issuing a new schedule, "in the hope that we can soon revert to our March 31 prices." If other fabricators are slow to make the adjustment it is because they are on extended vacation, or operating at such a low output that they would not care to base prices upon it, or hope that the present confused position will clear up.

If American copper went to 40 c. it would reach its highest level since 1872; higher, that is, than it reached in either of the two world wars. It must also cause some reflection on American pricing policy. The responsibility for 40 c. could not be laid at the door of the London Metal Exchange—where some American firms have been glad to do business recently. Indeed, when world supply and demand are as badly dislocated as they have been in the last 18 months, no pricing system can avoid distress. The only questions are, whether the American could not have had a bigger share of world supplies if their pricing had responded more flexibly to supply-demand conditions, and whether the task of the consumers in pricing their products would not have been easier given a free market price in place of one that has made two jumps of about 10 per cent and is now about (presumably) to make another of the same size. Meanwhile, some progress has been made in the past week in settling the strikes which have cost 75,000 to 80,000 tons of copper so far. It is reported that American Smelting and Refining has reached an agreement with the Mine Mill Union and that, as we go to press, union members are voting on it. It is fully expected that they will accept. Kennecott are still held up, it is said, by disagreement on a pension issue. These negotiations are not likely to be immediately affected by Attorney General Brownell's detailed application to have the Mine Mill Union declared a communist-infiltrated organisation under the Internal Security Act. (This is not without its amusing side. The Union is accused *inter alia* of demanding the end of diplomatic relations with Spain. It is also accused of opposing the Taft-Hartley act, which many interests have been demanding should be invoked to send the strikers back.) However, the ultimate effect would be to strengthen the forces, set in motion by the C.I.O. years ago, tending to drive the Mine-Mill Union out of business.

To help ease the predicament of some fabricators the Office of Defence Mobilization has authorized the release of 5,750 tons to be sold by G.S.A. at market prices plus handling costs, in addition to the 16,000 tons already authorized for this quarter. The 5,750 tons was accumulated under the Defense Production Act and is available only for use on military contracts by fabricators who can prove that they cannot get copper at any price. It is, of course, a pitifully small addition to supplies and it has led Congressman Patterson to renew his demands for a total export embargo, a total halt to stockpiling and consideration of the release of the 100,000 tons bought from Chile last year. Even if the strikers are settled immediately unemployment must continue among copper users because all stages of the pipe-line are virtually empty. There is only one source of ready copper and that is the national stockpile. It remains to be seen whether, when the strikes are over, the president can be induced to release it.

The improved international situation may have a bearing on the decision. Meanwhile, it is reported that, effective August 11, copper shipped into the United States for domestic consumption or for re-export has been placed under quota controls. Previously this copper was not restricted. The Bureau of Foreign Commerce has announced that only applications for licenses covering foreign orders accepted before July 27 will be considered for the third quarter.

It is reported from Chile that employees at Chuquicamata and Potrerillos have threatened an immediate strike unless they are granted a wage increase of 200 per cent. It is further reported that an unnamed foreign copper refining company has offered

to sell all Chilean copper in Europe and to build a refinery in Chile. There is a familiar ring about all this Chilean news. Officials of Anaconda and Kennecott have commented on yet another rumour that their companies have agreed with the Chilean government to sell two-thirds of Chilean copper production to Europe so long as the American price is only 36 c. per lb. The officials say that Chilean production is in any case already sold for the rest of this year while when the American price goes up to 40 c. they do not expect Chileans to be dissatisfied.

There is no definite news from Rhodesia as to the course of negotiations between the European Union and R.S.T. on African advancement, but it is comforting to know that they are continuing.

Lord Malvern, federal prime minister, has regretted in parliament that the recent agreement on African advancement in the Anglo American group mines does not cover the whole of the area. He considered the bone of contention over consultation in the future to be "purely academic." He also said that about 600 advanced openings were being created for African people which is a slightly higher estimate than has come from most sources.

Meanwhile, conciliation proceedings are due to start today on the dispute that has arisen over the payment of copper bonus following R.S.T.'s fixed price policy. The International Lead Organization is said to have prepared a study of the labour situation on the Copperbelt for the November meeting of the governing body.

LEAD. There has been a very good demand for lead on the basis of 15 c. per lb. New York in the past week and for this metal, too, there is speculation as to the possibility of a further advance in price. Metal for August delivery has long since been sold and September orders are well booked. Furthermore, about 30,000 tons of metal have been lost as a result of the strikes at American Smelting and Refining's plants.

However, mine production has not been affected so that the ores and concentrates have been piling up against the day when the refineries will start up again. Thus making good the losses should not be too difficult. At the same time a good deal of Mexican metal has been available.

Nevertheless, the statistical position of the metal—which in the present state of keen demand will determine the timing of the rise—must have been improved by the strike. Stocks of refined lead held by primary refineries at the end of June were down to 44,599 tons from 50,947 a month earlier and 104,626 a year earlier. What is by no means certain is whether the G.S.A. will continue to buy at over 15 c.; it is true that offerings in recent months have been meagre but even so the industry has been glad of this assured outlet. G.S.A. has never committed itself to buying at any price but the feeling that 15 c. was its buying limit was strong a year ago. It might not be so strong with a presidential election looming up in 1956.

TIN.—Tin has tended to be a weaker market in New York in the past week with the spot price of Straits metal slipping down to below 97 c. per lb. In part, this has reflected the easiness in the London market but it has been prompted rather more by American credit restrictions and by the minor shake-out on Wall Street. There is, however, no real uncertainty about the future course of American business and temporary pauses are no evidence that confidence is fading. The American market is, nevertheless, paying considerable attention to the trend of events both in Singapore and Malaya. In neither is the path to self-government going to be easy. The prospects of strike action for political objectives have increased very much in the last six months, and any dislocation of supplies would quickly affect the world's markets' present delicate poise. In the longer run, too, many of the statements now being bandied about by political leaders are not conducive to the further investment and exploration which is badly needed.

Meanwhile, Federal Facilities Corporation has announced the extension of contracts with Bolivia and Indonesia both of which had expired on July 30. The Bolivian contract called for 2,500 tons of tin in concentrates against 3,000 tons in the previous quarter; transport difficulties are given as the reason for the fall. The new contract with Indonesia ends on October 20 and is for delivery of 1,600 tons of concentrates against 2,000 tons in the previous quarter. The F.F.C. has also contracted to take 500 tons of Belgian concentrates in the three months ending October 31. No tin has been bought in Thailand since the last contract ended in March. Government officials estimated that purchases of tin over the next 12 months would total between 20,000 and 22,000 tons; they might

go up to the present estimated world surplus of 23,000 tons but it was said they would not exceed it.

A law authorising the president of the French Republic to ratify the International Tin Agreement has been published in the *Journal Officiel*. Nothing more now remains but for the President to sign it.

ZINC.—Zinc has been in moderately good request in the United States on the basis of 12.50 c. per lb. East St. Louis for Prime Western Grade. There is still talk of the possibility of another advance in the price but there is none of the feverish buying that usually precedes such a move nor is the holiday season far enough behind for this to be immediately "on the cards". In fact, the smelter's stocks of slab zinc in July showed their first increase after 13 consecutive monthly falls and rose from 48,603 to 51,305 tons on the month. The rise reflects only the drop in deliveries because of the approach of the holidays and there is every reason to expect that smelter stocks will resume their decline in August, when figures become available. July deliveries were 81,713 tons against 99,039 in June. Nevertheless, unfilled orders at the end of July were up from 57,231 to 64,056 tons and production was well maintained at 84,415 tons against 84,458 in June.

The special high grade zinc is still in very strong request and there is no sign that demand is falling as the end of the 1955 car manufacturing programme comes in sight.

TUNGSTEN.—The South Korean Government's Taihan Tungsten Corporation has announced that at the Eighth International Auction on August 18 it will offer for sale 440 tons of high grade tungsten ore. As previously sealed bids will be received simultaneously in London, New York and Seoul.

URANIUM.—Mr. L. St. Laurent, speaking at a press conference in Ottawa at the end of last month declared that Western nations, including Canada, may soon make a declaration to clarify their policy on purchases of uranium. The Canadian Prime Minister made this announcement after stating that he understood the Canadian Government's policy was to purchase all the uranium produced in Canada at a maximum price of \$7.25 a lb. until 1962. This statement sits uneasily with the announcement by Mr. C. D. Howe, the Canadian Trade Minister (see this column last week) who asserted earlier in Toronto that the government had agreed only to pay a guaranteed price for the uranium concentrates it purchases until 1962, adding that the government had never said it would absorb all uranium production until that date.

Mr. St. Laurent, when asked whether there was to be an international announcement with regard to policy on the purchase of uranium, refused to be drawn. He had not heard of any change in policy, and although there might be a declaration to clarify policy he had not heard of any suggestion that there was to be a change in policy.

The United States has announced the world's first price list for the sale and lease of uranium and heavy water. Admiral Lewis Strauss, Chairman of the United States Atomic Energy Commission, said at Geneva this week that uranium enriched to 20 per cent in U-235 for use in atomic research reactors would be leased to friendly nations for co-operation in the civil uses of atomic energy at 25 dollars per gram of contained U-235. For normal uranium metal, the price would be 40 dollars per kilogram and for heavy water 28 dollars a lb. Bilateral agreements, he added, with the United States had now been concluded with 27 countries who would now be able to lease enriched uranium and buy normal uranium metal at the prices he had quoted.

However, heavy water was not represented under the bilateral agreements. Any uranium enriched above 20 per cent would be unlikely to be leased or sold by the United States to other nations as this would be fringing on material for warlike purposes.

The London Metal Market

(From Our Metal Exchange Correspondent)

The American strike situation in the copper industry seems likely to continue without much change for a short time, and after a settlement has been reached a rise in the price to 40 c. per lb. is expected. This is a "bearish" factor for the London market as the majority of producers will then be on the same level and normally marginal tonnages are dealt in at a small premium of about £10-£15 above the basis price. Continental demand is still under the influence of the holiday season. Chilean production figures show that the expected increase is being fully realized for the first-half of the year.

Tin has shown an easier tendency in common with other metals, and the dearer money policy is no doubt having its

effect on all metals. It is announced that the contract for the supply of tin concentrates by Indonesia to the U.S. has been extended to October 31, but the quantity is understood to be smaller than that for the three months' period which ended on July 31.

The French Government has passed a law authorizing the President of the Republic to ratify the International Tin Agreement. This is the last formality before actual ratification and will result in sufficient votes on the consumer side to bring the Agreement into operation. On the producer side there are so far insufficient votes for the scheme to come into force, and the Indonesian votes are still required. On Thursday morning the Eastern price was equivalent to £757½ per ton c.i.f. Europe.

There is very little to report in lead which has followed very much the pattern of other markets. In the U.S. demand has been active, but in Europe it is rather slow on account of holiday influences.

The European position in zinc is similarly affected by holidays. The latest American figures for July show a small rise in stocks, but this is of little significance as producers recently have not been offering the U.S. Government all it would be willing to take each month. Consumption may also have been affected by the scarcity of copper.

Closing prices and turnovers are given in the following table:

	August 4		August 11	
	Buyers	Sellers	Buyers	Sellers
Copper				
Cash	£368½	£369½	£357½	£358½
Three months	£361	£363	£351	£352
Settlement	£369½		£358½	
Week's turnover	2,800 tons		3,450 tons	
Tin				
Cash	£763	£764	£747½	£748½
Three months	£757½	£758	£742½	£743
Settlement	£764		£748½	
Week's turnover	385 tons		605 tons	
Lead				
Current half month	£107½	£108	£104½	£105
Three months	£107½	£107½	£104½	£104½
Week's turnover	1,400 tons		2,975 tons	
Zinc				
Current half month	£90½	£90½	£88½	£89
Three months	£90½	£91	£88½	£89
Week's turnover	2,775 tons		4,950 tons	

OTHER LONDON PRICES — AUGUST 11

METALS

Aluminium, 99.5%, £171 per ton	Nickel, 99.5% (home trade) £519 per ton
Antimony—	Osmium, £24/27 oz. nom.
English (99%) delivered, 10 cwt. and over £210 per ton	Osmiridium, £40 oz. nom.
Crude (70%) £200 per ton	Palladium, £7 0s./£7 10s. oz.
Ore (60% basis) 23s. 6d./	Platinum U.K. and Empire
24s. 6d. nom. per unit, c.i.f.	Refined £29 oz. Imported
Bismuth	£31 oz.
(min. 1 ton lots) 16s. lb.	Rhodium, £40
Cadmium 11s. 6d.	Ruthenium, £17 oz.
Chromium, 6s. 11d./7s. 4d. lb.	Quicksilver, £108
Cobalt, 21s. lb.	ex-warehouse
Gold, 251s. 5d.	Selenium, 43s. nom.
Iridium, £30 oz. nom.	per lb.
Manganese Metal (96%-98%)	Silver, 79½d. f.o.z. spot and
£269 according to quantity	79d. f'd
Magnesium, 2s. 4d. lb.	Tellurium, 15s./16s. lb

ORES, ALLOYS, ETC.

Bismuth	20% 3s. 3d. lb. c.i.f.
	65% 8s. 6d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semi-friable) 48%	£13 per ton c.i.f.
" Refractory 45% ..	£13 per ton c.i.f.
" Smalls 42% ..	£10 2s. 6d. per ton c.i.f.
Magnesite, ground calcined ..	£26-£27 d/d
Magnesite, Raw ..	£10-£11 d/d
Molybdenite (85% basis) ..	105s. 0d.-108s. 0d. per unit c.i.f.
Wolfram and Scheelite (65%) ..	253s./257s. c.i.f.
Tungsten Metal Powder ..	20s. 6d. nom. per lb. (home)
(98% Min. W.)	
Ferro-tungsten (80%-85%) ..	17s. 6d. nom. per lb. (home)
Carbide, 4-cwt. lots ..	£37 6s. 3d. d/d per ton
Ferro-manganese, home ..	£53 17s. 6d. per ton
Manganese Ore Indian c.i.f.	
Europe (46%-48%) basis 100s.	
freight.	80d./83d. per unit
Manganese Ore (38%-40%) ..	66d./68d. per unit
Brass Wire ..	3s. 4½d. per lb. basis
Brass Tubes, solid drawn ..	2s. 9½d. per lb. basis

COMPANY NEWS AND VIEWS

A Concentrator for Rho-Kats

The June quarterly report of Kansanshi Copper Mining, of which Rhodesia-Katanga holds approximately 35 per cent of the equity, states that a site and a flowsheet for the concentrator has been chosen, that specifications have been issued for the plant required, and that all the major items have been obtained secondhand from various sources in Southern Africa. Dewatering and underground development at the mine is proceeding. The main north and main south shafts were re-equipped in April for hoisting and pumping, dewatering in the main south area commenced on May 9 last and, at the end of June preparations were in hand to dewater the main north shaft.

Camp Bird to Make Capital Repayment

Camp Bird will recommend that shareholders sanction the return of 9s. per 10s. share in the form of a capital repayment at an extraordinary meeting convened for October 27 next. The recommendation will require a majority of 75 per cent of the shareholders as it will take the form of a special resolution.

In making this announcement the company has also stated that re-organization of its portfolio has now been completed and that its estimated investment income, subject to no major changes, indicates a final payment of 7½ per cent to make a total distribution of 15 per cent for the current year.

Tronoh Pays More

Tronoh Mines have recommended for 1954 a final dividend payment of 4½d. per 5s. share, equivalent to 7½ per cent on its £1,000,000 issued capital. Four interim payments totalling 80 per cent were paid on £300,000 issued capital before the 7 for 3 scrip issue, while a fifth interim of 7½ per cent was distributed on the present issued capital.

The 1954 outgoings to shareholders represents an effective increase of 15 per cent over the 1953 payments which totalled 80 per cent on £300,000 issued capital.

The net profit for 1954—struck after all charges, including tax of £405,613 (£251,649)—was £292,987 compared with £219,992 in 1953. The dividend payments for 1954 absorbed £216,375 against £130,500 a year ago when £113,956 was placed to reserve.

Two interim payments, each of 5 per cent have already been paid in respect of the current year. Mr. J. H. Rich is chairman. Meeting, London, September 16.

Some Anglo-Oriental Group Results

Four Malayan registered tin producers of the Anglo-Oriental group have circulated their full reports and accounts, the salient statistics from which are tabulated below. All these companies, except in one case alone, have identical directorates. Their meetings will be held at Kuala Lumpur, Malaya on August 12. Mr. D. T. Waring is chairman of all the companies.

Company and Issued Capital	Year to Mar. 31	Output Tons Metal	Price recvd per ton metal	Net* Profits £	Dividend £
Rawang Concs.	1955	364	707	38,630	38,500
£200,000 (£1)	1954	526	641	65,687	56,000
Rawang Tin Fields	1955	664	699	165,964	153,300
£876,003 (10s.)	1954	294	668	95,027	91,980
K'pong Lanjut Tin	1955	—	—	20,079†	Nil
£300,000 (£1)	1954	133	645	DR2,647	Nil
Kuala Kampar Tin	1955	1,816	706	419,175	387,450
£615,000 (10s.)	1954	1,432	643	208,126	193,725

* After tax and all charges.

† Resulting from tribute operations.

At Rawang Tin Fields the reconstruction of No. 3 Dredge was completed by mid December 1954. At that time trials commenced and the plant was placed on a full commercial operating basis as from January 1, 1955.

The year's operations by Kampong Lanjut Tin Dredging was concentrated on tributing which brought in £33,507 as compared with £22,439 during the preceding year. The figure of £33,507 thus represented total revenue as against £108,048 previously.

Decline in Lake View's Profits

A total of £469,762 represented the estimated mining surplus (before taxation, depreciation, London expenses, etc.) earned by Lake View during the year ended June 30, 1955. During the pre-

ceding year this Australian gold producer earned £484,198 on the same basis.

A feature of the year's operations was that the tonnage of tailings retreated rose sharply to 908,836 s. tons from 643,343 l. tons. On the other hand, ore milled showed little change at 731,609 s. tons as against 743,047 l. tons from which 165,141 ounces of gold (169,794 oz.) were recovered.

Geevor's Bigger Distribution

Geevor Tin Mines—the Cornish producer—has recommended the payment of a final dividend of 1s. 6d. per 5s. stock unit making, with the interim of 9d. already paid, a total of 2s. 3d.

RAND AND O.F.S. RETURNS FOR JULY

Company	July 1955			Current Financial Year Total to date			Last Financial Year Total to date		
	Tons (000)	Yield (oz.)	Profit* (£000)	Tons (000)	Yield (oz.)	Profit* (£000)	Tons (000)	Yield (oz.)	Profit* (£000)
Gold Fields									
Doomfont'n	51	20,049	85.2	51	20,049	85.2	50	16,250	77.9
Libanon	100	21,235	60.3	100	21,235	60.3	97	20,130	50.3
Luipaards V.	127	18,773	272.4	127	18,773	72.4	110	21,738	45.4
Rietfontein	25	5,515	13.9	185	41,556	146.7	195	43,582	167.2
Robinson	83	17,700	16.5	576	123,777	149.0	686	164,191	167.1
Simmer	123	20,215	17.6	834	139,604	111.2	883	142,205	76.5
Sub Nigel	67	21,237	85.5	67	21,237	85.5	67	21,912	95.3
Venterspost	125	29,056	79.0	125	29,056	79.0	108	26,228	60.8
Vlaakfontein	38	13,970	71.5	270	95,217	512.3	269	95,920	496.2
Vogels	103	26,548	156.1	720	185,670	871.7	716	181,241	758.5
West Drie	71	54,398	436.1	71	54,398	436.1	52	38,970	303.5
Anglo									
American									
Brakpan	109	18,540	18.1	746	127,309	105.0	775	130,705	94.4
Daggas	229	52,333	320.3	1,585	361,731	2224.0	1,541	358,313	2200.5
East Daggas	97	16,035	45.3	673	112,172	429.0	652	110,767	323.0
P Brand	47	17,017	308.7	290	217,131	1703.3	—	—	—
P. Steyn	78	27,257	144.3	491	164,162	748.0	156	41,069	53.3
S. A. Lands	94	17,777	55.1	663	125,064	391.5	699	128,515	375.8
Springs	120	15,339	9.4	833	109,946	57.1	906	126,935	53.2
Welkom	81	15,823	13.3	556	109,367	63.4	490	97,309	21.9
W. Hlids.	70	25,497	150.6	452	167,762	842.7	323	109,449	373.6
W. Reef Ex.	116	22,160	55.2	823	153,904	382.2	804	158,698	455.0
Central									
Blyvoor	112	62,580	476.3	112	62,580	476.3	111	63,203	493.3
City Deep	166	30,601	1.5	1,114	212,929	12.3	1,144	218,222	116.4
Cons. M.R.	180	24,972	25.6	180	24,972	25.6	189	26,161	34.5
Crown	314	49,572	51.7	2,092	146,034	348.7	1,969	312,638	341.4
D. R'poort	190	31,418	53.7	1,250	210,987	345.9	1,228	203,680	310.9
E. Rand P'p	221	53,281	170.2	1,487	355,543	1105.3	1,397	316,553	838.7
Harmony	63	22,689	110.4	63	22,689	110.4	—	—	—
Modder B.	57	5,733	1.1	399	39,981	7.2	394	41,385	18.0
Modder East	131	13,669	8.1	131	13,669	8.1	121	13,789	11.0
Rose Deep	58	9,001	5.8	419	65,354	52.4	492	75,097	84.5
Weigedacht	34	3,776	0.5	34	3,776	0.5	34	3,968	1.7
J.C.I.*									
E. Champ	20	1,666	0.6	139	10,938	142.6	164	16,105	47.4
Freddies C.	79	13,631	149.9	574	103,069	235.5	522	88,690	113.5
Govt. G.M.	260	30,567	13.1	1,775	226,621	195.3	1,817	235,376	212.4
Randfontein	274	29,624	196.2	1,821	203,114	1,644.4	2,007	266,533	147.8
Union									
East Geduld	152	46,740	355.4	1,039	319,507	2408.2	940	289,033	2106.2
Geduld Prop	104	16,656	44.9	610	115,936	313.8	642	104,627	184.4
Grootvlei	200	43,304	257.6	1,345	290,927	1681.4	1,257	267,536	1494.9
Marievale	72	18,719	91.2	507	128,579	616.5	452	115,059	501.4
St. Helena	105	28,871	150.8	725	176,593	877.3	562	124,179	357.3
Van Dyk	81	13,457	2.4	559	92,786	13.1	550	95,096	12.8
General									
Anglo									
Ellaton Gld.	32	8,685	39.2	213	63,192	312.3	183	51,867	230.1
S. Roodep't.	28	6,089	21.5	28	6,089	21.5	29	6,142	21.0
W. Rand C.	250	28,749	242.2	1,664	194,373	1567.4	1,571	196,047	1276.9
Stillfontein	84	32,971	206.3	585	229,858	1445.1	570	190,486	1084.2
Transvaal									
Harteb'st'n	44	14,750	0.57	44	14,750	0.57	—	—	—
N. Klerks	11	1,462	0.1	79	9,895	14.0	78	5,424	1.8
Ranc. Leases	191	30,274	40.3	191	30,274	40.3	184	30,913	40.1
Village M.R.	35	5,089	9.7	35	5,089	9.7	35	5,260	11.5
Virginia	65	13,975	442.9	65	13,975	442.9	—	—	—
Others									
N. Klein	109	12,770	5.1	752	88,340	40.1	753	93,716	105.7
W. Nigel	18	3,975	8.4	18	3,975	8.4	18	3,886	9.5

L Indicates loss.

* Working profit includes sundry revenue.

† Excluding gold sales at premium prices.

‡ Gold and uranium.

a Including Bird Reef milled 34,000 tons; recovered 1,375 oz.; profit £46,000.

b Including £41,500 uranium profit. Before loan and instalment repayments.

c Operations affected by fire in No. 5 shaft. Normal working expected early in August.

d After crediting £40,000 estimated uranium revenue.

e After crediting £8,014 estimated revenue from pyrite.

f After crediting £320,000 estimated net revenue from uranium and acid.

g After crediting £268,000 estimated profit from uranium.

h Excluding uranium profit which is declared quarterly.

i After crediting £1,000 from uranium, before deductions of £625.

j Stopping operations suspended July 6-12 owing to underground fire.

k After crediting £20,892 from acid. Before deductions of £16,318.

m Maiden return.

for the year ended March 31, 1955. Those payments absorbed a net total of £26,316 against £19,866 a year ago and were taken from taxed earnings of £57,970 (£36,608). The sum of £30,000 (£10,000) was allocated to reserves and the carry forward was left at £10,429 compared with £10,840 brought in. Meeting, London, September 14.

Ayer Hitam to Raise About £550,000

A rights issue is to be made by Ayer Hitam Tin Dredging with the object of raising about £550,000. The terms have not yet been announced but an extraordinary general meeting has been called for August 22 to consider increasing the company's authorized capital from £200,000 to £325,000 by the creation of 500,000 additional 5s. shares.

It will be recalled that last May arrangements were made to purchase a large electrically driven deep-digging dredge from an Australian gold company. At that time it was stated that total expenditure in transporting this dredge to Malaya would be heavy and that finance was accordingly being considered for the scheme. The latest proposals therefore represent the company's final decision.

Tanjong Tin to Sell Sungei Luas Mining Leases

Tanjong Tin has accepted an offer from Lower Perak Tin Dredging for the outright purchase of the Sungei Luas mining leases which are adjacent and continuous to Lower Perak Company's mining property. The offer is subject to confirmation of ore values by the check-boring now being undertaken by the general managers of Lower Perak Tin. A further statement will be made on completion of the check boring.

South Bukeru Earns More

Untaxed profits of South Bukeru in 1954 advanced to £8,368 from their previous year's level of £3,369. Columbite production may have played a major part in this achievement as output rose from 3½ tons to 8½ tons. Tin production totalled 74½ tons against 83½ tons in 1953. Taxation took £5,350 (£2,200), the sum of £2,500 (nil) was allocated to reserves and after taking into account the payment of £4,584 net to meet the 33½ per cent (16½ per cent) interim payment—no final dividend has been recommended—the carry forward was poorer by £429 at £2,890. Meeting, London, September 26.

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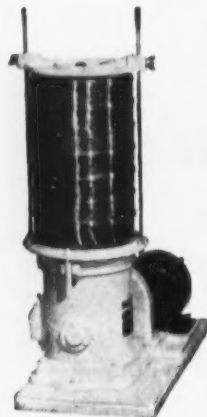
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